**January 13th, 2024.**

**How did I come up with my science fair project idea?**

My grandpa has Alzheimer’s but it’s still in the early stages. I wanted to learn how we can stop it from happening and then this science fair came along. I decided to research how we can delay it and why it happens.

**January 18, 2024**

In Alberta, there are over 40,000 people who suffer from Alzheimer’s.

**February 8, 2024**

- Alzheimer’s is caused by Plaques and tangles.

- Plaques are beta amyloids that build up and block the signals of the neurons. Neurons send signals throughout your brain that tell you to talk, think, and move. Once the plaques block the signals, your brain cannot function properly. When it can’t function properly, your body and brain cannot do what a normal person can do. People with Alzheimer’s completely rely on other people to help them. Once the neurons can’t send signals, the brain shrinks, causing Alzheimer’s. Beta amyloids can seriously get in the way of the neurons, which can cause inflammation. The inflammations can damage the neurons, which will also disturb the signalling.

- Tangles are caused by loose taus. Taus are a special protein that keeps the neurons together, so that they don’t come apart. Although scientists and doctors haven’t figured out the exact reason, they have done a lot of research and have found some theories on why it happens. Taus come apart by chemical changes that are not normal in the brain. Since the taus are sticky, they stick together, creating more clumps in the brain. Those clumps are called tangles. The tangles block the signals from the neurons as well. Also, since the taus have fallen off, the neurons fall apart.

- Once the neurons start to die or fall apart, many changes happen to the brain and body. The first stage is when the person starts to develop short term memory. Then, the second stage is when they cannot process any logical thoughts. For example, when they put a piece of paper into a fireplace, the paper is burned and now turned into ashes. People with Alzheimer’s cannot process that. Stage 3 is when the tangles and plaques move to a section where it controls the persons’ emotions. When that happens, the person has sudden mood changes For example, when the person who has Alzheimer’s is happy, the next second you turn back to that person, they can have a totally different emotion. Stage 4 is when they start to experience hallucinations. Stage 5 is when the person forgets their long-term memories like their family and friends. And finally, stage 6 is when the tangles and plaques take control of the control centre. It’s when they cannot breath or the heart rate goes down, causing death.

**February 9, 2024**

- Tangles and plaques start forming in the hippocampus, which is important for handling memories. Once the cells die in the hippocampus, the person starts to lose memories/starts developing short term memory.

**February 11, 2024**

- Scientists have been trying to find a cure for Alzheimer’s, making a drug. It’s a collaboration between Japan and the United States, making a drug called Aduhelm. But it’s super expensive, costing around $25,000 dollars per year. An average person that has retired gets $1,000 dollars per month, making it impossible to buy that medicine. So for an alternative, there are different ways to help reduce your Alzheimer’s without buying any expensive drugs.

**February 13, 2024**

1. Omega 3: Omega 3 helps make your blood circulation more smoother, letting your brain get more blood and blood that is better.

2. Taking baths: Taking baths

3. Exercising: When you exercise, your heart beats faster, which pumps more blood. The blood is very important for the brain. (scrapped)

The microglia also contributes to Alzheimer’s. Just like taus (tangles) and beta Amyloids (plaques), they have once helped the brain in a good way. But once the person has grown older, the microglia has turned its back on the person. When the person gets into their forties-sixties, the microglia can kill the brain cells/neurons and cause inflammation. When the person is younger, the microglia actually helps the brain. If the brain has a little damage to it, the microglia can help heal it. But just like the beta Amyloids and taus, it eventually turns bad, and we can’t do anything about it.

**February 15, 2024**

How are even beta Amyloids made? - Originally, beta Amyloids were once helpful to the brain. It helps other cells attach to each other. They were called Amyloid Precursor Protein, or known as APP. The APPs, a protein, are in between a cell membrane in a neuron. One end of the APP is outside of the neuron, while the other end is inside. Scientists say that the APP helps the neurons repair itself when it is damaged. Like anything else, it eventually gets broken and the brain doesn’t need it anymore. So when the brain doesn’t need that APP anymore, it cuts it off into two parts. An enzyme, an alpha secretase and gamma secretase cuts the protein. The alpha secretase cuts off the upper part of the APP and the gamma secretase cuts off the middle/end of the APP. When it is done correctly, the APP should dispose properly and cause no problems. In the incorrect way, another enzyme, beta secretase, cuts off the very tip of the APP. Then the gamma secretase cuts off the bottom. While the tip is disposed of, the bottom stays and doesn’t go away. Now, it is called the beta Amyloid.

What are some ways to delay Alzheimer’s? - There are multiple ways to slow down Alzheimer’s, and I will be listing all of them.

**February 23, 2024**

1. Exercising - Exercising is known for keeping your body healthy, but can it help delay Alzheimer’s? The answer is, yes, but how? Well, there are certain exercises that can delay Alzheimer’s. Aerobics is a type of exercise that uses a lot of oxygen and pumps more blood than weight lifting. Blood is very important for delaying Alzheimer’s. Blood is important because when people start to develop Alzheimer’s, less blood gets to the brain. Here are some examples of aerobics: running/jogging, bicycling, swimming, dancing, and hiking. What makes aerobics different from other workouts is that it lasts at least 45 minutes to an hour for moderate aerobics, and 30 minutes to 45 minutes for vigorous aerobics per session 5 days a week. Weight lifting can last up to 60-90 minutes if you are only doing it for one day a week. If you train 2-3 days a week, then it would last for 40-60 minutes per session. Exercising also makes your body energised. When it is energised, your body is more energised and can heal broken cells easier.

**February 24, 2024**

2. Socialising - Socialization is a great mental workout for the brain. It exercises the brain and makes it energetic, hence making it less prone to making mistakes (cutting the wrong part of the APP, making it beta amyloid).

3. Eating healthy - Eating healthy can help prevent inflammation in the brain, protecting it from damaging the neurons. It can also make it easier to defecate, taking more bad things out of the body.

4. Puzzles/Reading - Doing puzzles can improve your brain functions. It challenges your brain to work. When doing jigsaw puzzles, the person uses their long-term memory to figure out which puzzle piece goes where by colour, shape, and patterns. Although this may seem like a simple activity for a person younger than 40-30, a person with Alzheimer’s is harder because they can get frustrated easily. As said earlier, stage 3 is when the person has sudden mood changes. Even though they might be excited to start a new jigsaw puzzle, two minutes later, they might be angry or upset. It is also harder for them because they might not remember the rules and patterns of a jigsaw puzzle.

**February 25, 2024**

Sudoku and crossword puzzles also might be able to slow the progression of Alzheimer’s. Studies say that it doesn’t make a huge impact, but it is still better than nothing.

**February 26, 2024**

Avoid smoking - We all know that lung cancer is mostly caused by smoking, but it is a cause for Alzheimer’s as well. It damages the blood cells in the body, making it hard to send blood to the brain. The brain needs blood to function, and if blood is not going to it, it will fail to function. Another reason is that smoking causes inflammation. Inflammation is when the body swells. But if that happens in the brain, it can damage the surrounding brain cells.

Age - Sadly as you know, the older the person with Alzheimer’s gets, the worse Alzheimer’s will get. Alzheimer’s typically starts at the age of 50-55, but it is unnoticed. Then at 65, signs start showing like short term memory loss. As they get older, Alzheimer’s worsens, eventually forgetting their child, family, or spouse.

Genetics -

**Now, for the final grand question, why does Alzheimer’s start to happen when you get old?** - As said earlier, exercising makes you more energetic and it makes it easier for your body to heal your broken cells. But when people get older (55-65), they tend to stay at home more often. 65 is also the age when people start retiring. When they work, they use their bodies and minds more. Then, when they retire, they are more likely to stay at home and sit all day. Also, until the age of 16(girls)/18(boys), their bodies develop. Then for the rest of their lives, they use the cells their body created for them. And then, when they are in their late fifties/sixties, the cells get tired and start becoming slower and slower. That is also another reason why older people are more prone to developing Alzheimer’s.

**February 27, 2024**

(Addition to healthy foods.) Here are the types of foods to delay Alzheimer’s: Fish, omega 3, fruits, vegetables, and nuts.

Omega 3 - Omega 3 is known for improving memory, and that is true. It also reduces the risk of inflammation in the brain.

Fish - Fish contains omega 3, which is helpful in delaying Alzheimer’z.

Fruits and vegetables - Fruits and vegetables contain something called flavonoids. Flavonoids have anti-inflammatory properties. It can soothe inflammation that is happening in the brain. Also, it improves the blood flow which helps the brain function.

Nuts - Nuts have omega 3 inside it, which is helpful for delaying Alzheimer’s.

**February 29, 2024**

Medicine for Alzheimer’s - Although there is no cure for Alzheimer’s, there has been a medicine to *slow down* Alzheimer’s, and that is called Leqembi (Le-kem-bee). Leqembi is made by two companies named Eisai and Biogen. It is a collaboration between America (Biogen) and Japan (Eisai). It removes the beta amyloids/plaques from the brain, but it is only effective in the early stages. They use an IV to insert the medicine/drug. But the thing is, it is not approved in Canada, but in America, Japan, and China. It’s also very expensive, costing 26,500 dollars. And of course, there are downsides to it besides the price. Leqembi can cause headaches, dizziness/nausea, brain bleeds, swelling, and vomiting.

Conclusion - The reason for Alzheimer’s is because of plaques (beta amyloids) and tangles (taus). It is also caused by the microglia. Plaques are caused by cutting off the wrong part of the APP (Amyloid Precursor Protein). Then it clumps up and blocks the signals of neurons. Tangles are caused by taus coming off and the neurons disintegrating, also sticking together and blocking the neuron’s signals. The microglia was once helpful to the brain. But then it starts killing brain cells and causing inflammation. It starts to happen when the person is older because the person tends to stay home most of the time and sit all day. Then their body and mind will deteriorate. Also, the cells inside them will tire after helping them for 50 years, which then it is easier for their brain/body to make more mistakes.

 Some ways to delay Alzheimer’s (without medication) are: exercising, puzzles, eating healthy, socialising, and not smoking. While exercising, your body makes more blood, which is helpful to the brain. Puzzles use your short term memory and long term memory. That can challenge your brain and your memory. Socialising is a great mental workout for your brain. It also allows you to become more friends with people and get even more social. Eating healthy prevents inflammation and improves memory. Smoking can cause inflammation so it is a good idea to not smoke.

 Leqembi is not a cure for Alzheimer’s but it removes/kills beta amyloids. It is inserted by an IV and can be extremely helpful. The side effects of this medication is that it costs 26,500 dollars per year and can cause multiple problems. Examples: brain bleeds, brain swelling, nausea/dizziness, and headaches. I would definitely take it if the prices become cheaper and the side effects become more normal like headaches and colds; or if I was a very wealthy person.

**March 1, 2024**

Data for Alzheimer’s rate in Canada over the past 5 years (2024 and 2023 were not included because the information was not collected on the internet):

2022 - Around 700,000

2021 - Around 630,000

2020 - Around 550,000

2019 - Around 480,000

2018 - Around 410,000

Data for Alzheimer’s rate in Alberta over the past 5 years (2024 and 2023 were not included because information was not collected on the internet):

2022 - Around 30,000

2021 - Around 29,000

2020 - Around 28,000

2019 - Around 27,000

2018 - Around 26,000

Graphs for Leqembi (difference between people who took and who didn’t):



**March 2, 2024**

Old stuff - **What is Alzheimer’s?** - Alzheimer’s is a type of dementia. It affects a person's memory and thinking. It can be so bad that it can affect daily life activities. Most people start having it when they're 65 or older. Alzheimer’s will worsen as the person gets older.

**What even is dementia? -** Dementia may be thought of as a disease but it’s not. People use that for a general term for forgetfulness, having difficulties to think properly, or interference in doing normal daily life work. It is **not** a disease. Dementia is caused by accidents that have happened in the past. For example: if a person had a car crash when they were little and it affected the brain, later when they get older, dementia can occur. Alzheimer’s is the most common dementia.

**How do we get Alzheimer's? -** Scientists have been researching for years trying to figure out why we get Alzheimer’s. They do not have the exact answer but are understanding a lot of what it is. Alzheimer’s can be caused by: genetics, lifestyle, environment, and changes in the brain caused by getting older. It’s important to know that Alzheimer’s can differ from one another. Let’s go into the specifics. **Dec 27, 2023 -** Genetics - If your family members have Alzheimer’s, it is more likely that you will get it too. But it does not mean 100% you will get it. Lifestyle and Environment - Study shows that people who smoke have a higher chance of getting Alzheimer’s.

**What are some ways to postpone Alzheimers? -** Although we can’t prevent Alzeimers, we can delay it. Here are some ways. 1, talk to people. This is a simple task you can do. It keeps your mind active if you are with others. You can also try to learn an instrument. It can keep your mind simulated as well. 2, exercise and stay active. Exercising can start new connections in the brain. If you want to do the bare minimum, you can do a walk or a jog around your neighbourhood. 3, do puzzles. Jigsaw puzzles, sudoku, crossword puzzles, and many more are great puzzles. Try to challenge your brain with other kinds of puzzles you are not familiar with. Puzzles can help stimulate your brain.

**March 3, 2024**

Understanding more about the microglia - The microglia is something very helpful to the brain. It does many things to help. First, it clears bad things out of your brain. Microglias search for dead brain cells/neurons, harmful protein clusters, and pathogens. Pathogens are something that starts a disease in the brain. It searches for dead/damaged neurons or diseases and when it finds it, they grab it with its spidery arms. Then it turns itself into a blob and eats the problem. They also touch neurons to see if it is okay or not. If the neuron is not okay or releasing some type of chemicals, it will eat it. Although it might sound a bit violent, it’s actually very helpful. But then how is it a cause for Alzheimer’s? Well, if you are depressed, stressed, have sleep problems, or your diet is unwell, the microglia can eat the healthy neurons, causing Alzheimer’s. Scientists say that microglias can be helpful to prevent Alzheimer’s but can also cause it. Microglias can eat the plaques and tangles, but it can also go too far and eat the healthy neurons as well, resulting in helping increase Alzheimer’s.

Enzyme meaning: An enzyme is a special protein that speeds up the process of the metabolism or a chemical reaction happening in the human body. As I said earlier, the gamma secretase, alpha secretase, and the beta secretase are an enzyme.

**March 10, 2024**

Who is more prone to Alzheimer’s? Male or Female? -

More about Leqembi - Leqembi is a medicine for slowing down the progression of Alzheimer’s. It takes out the beta amyloids/plaques out of your brain. Every 2 weeks for one hour, Leqembi is inserted into your body by an IV. The data shows that on average, a person taking Leqembi for 18 months delayed Alzheimer’s by around 7.5 months. A regular person who had Alzheimer’s and didn’t use Leqembi didn’t show any signs of lowered Alzheimer’s progression.

Effective in delaying the progression of symptoms by approximately 7.5 months.